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May 2, 2004

Federal Communications Commission
Washington, DC 20554

Re: ET Docket No. 04-37, Notice of Proposed Rule Making

In the Matter of)	
)	
Carrier Current Systems, Including Broadband over)	ET Docket 03-104
Power Line Systems)	
)	
Amendment of Part 15 regarding new requirements)	
and measurement guidelines for Access Broadband)	ET Docket 04-37
over Power Line Systems.)	

To the Commission:

I am responding to your Notice of Proposed Rule Making (“NPRM”) on the referenced Docket. I am both a licensed Amateur Radio operator (WA9ENA) and a N.A.R.T.E.-certified EMC engineer, having been employed as a professional in that capacity for nearly 20 years. I appreciate the opportunity afforded to comment on the Access BPL issue, as I feel strongly that it has the potential to affect very large numbers of users in the HF and lower VHF spectrum.

My comments directly relate to the paragraph numbers as they appear in the docket:

- 1, 30. The introductory and discussion paragraphs lack balance in that they fail to mention that other technologies also stand to deliver broadband services to rural areas. These are technologies which do not offer the potential for interference to the MF, HF, and low VHF portions of the electromagnetic spectrum. One such technology is high lighted in a proposal for Wireless Broadband operations in the 3650 to 3700 MHz band¹, and another is fiber optics. Fiber optic cables could carry the broadband signals to wireless interface units, similar to those being used for some of the present BPL trial systems, and the signals distributed for consumer use via a wireless link, as mentioned in paragraph 4 of the NPRM.

¹ FCC News release, April 15, 2004. Although the date of the news release is after the issuance of this NPRM, the basic technology for the proposed wireless service already exists.

- 10, 11, 12. These paragraphs discuss the advantages of Access BPL, including the frequently-mentioned service to rural areas. This commentator resides in rural Iowa, outside of any municipal corporate limits. While I am sure that towns with populations in the range of 1500 to 3500 persons fall into the “rural” classification, persons within the corporate limits of those size towns (in my area) already have, at the very least, CATV services available (whether they offer broadband data or not). However, no such services exist in the adjacent areas where the potential for customers might range between 4 or 5 per mile to less than 1 per mile. Given the necessity for use of repeater units, deployment of Access BPL into areas of such low population (and subscriber) density has not been discussed and does not seem viable on an economic basis.
- 13, 16. The thought that Access BPL will advance Homeland Security is only a wishful thought, at best. The reasons cited within the NPRM relate primarily to control of the power grid. Access BPL is much more likely to hinder any actual Homeland Security events, and other emergencies, because of the tremendous potential for interference to critical communications. Although the NPRM cites the January 8, 2004, letter of Under Secretary Michael D. Brown regarding comments of FEMA, the NPRM totally fails to cite any portion of the original FEMA filing of December 4, 2003. (A review of Mr. Brown’s letter, in which he appears to retract portions of the December filing, gives no technical basis whatever for the change in FEMA’s stance. Thus, no technical credibility can be, or should be, afforded to his letter until and unless his comments are substantiated with technical details.)

The original filing discusses the FEMA National Radio System (“FNARS”), which is used as the primary command and control backup communications media for the agency.² In that filing, FEMA concluded that implementation of BPL technology into the HF spectrum will result in “significant detriments to the operation of FEMA radio systems such as FNARS”. The filing further states that in order to maintain mission-essential HF operations in areas served by BPL technology, transmitter powers would have to be increased on the order of +30 dB³.

Operators in the Amateur Radio Service can not legally exceed 1500 watts of output. If Amateur Radio operators are assisting FEMA and other agencies in emergencies and/or Homeland Security events, they have no way to increase typical Amateur Service transmitter power output by 30 dB. An HF transmitter

² FNARS operates in the HF spectrum. The Amateur Radio Service also uses HF communications for coordination, health and welfare, and deployment determination in areas of wide spread emergency - severe storm damage, wild fires, earthquake damage zones, etc. Most such operations occur in the 3.5 to 4.0 MHz, 7.0 to 7.3 MHz, and 14.0 to 14.350 MHz bands.

³ Cited as: Federal Preparedness Circular, FPC 65, etc., on page 2 of the FEMA filing.

being used for emergency purposes will typically be running on automobile or portable battery power at RF output levels of 25 to 100 watts. An increase from 100 watts to 1500 watts is 11.8 dB, and from 25 watts to 1500 watts is only 17.8 dB. As a registered Emergency Responder in Jones County, Iowa, the impact of BPL to emergency HF transmissions from our area to cities where support and coordination will take place is a genuine concern. The deployment of systems which are known to interfere with HF communications (see my comments for paragraphs 33 and 34) is **not** an “advancement” of any sort, especially when national security and safety of lives and property are at stake.

16. The initial NTIA comments cited in paragraph 16 have been amplified by the release of the two volume study just completed by NTIA⁴. In the Executive Summary, the document states unequivocally that interference is likely to occur to land vehicle, boat, and fixed stations receiving moderate-to-strong radio signals in areas extending to 30 meters, 55 meters, and 230 meters, respectively, from **one** (*emphasis added*) BPL device and the power lines to which it is connected⁵. Since there is overlap, and even some commonality, of frequencies used by Government communications systems and Amateur Radio operators, the NTIA comments are just as applicable to the Amateur Radio Service as to the Federal users.
17. The comments from NASWA underscore a serious concern: the proposed Access BPL spectrum protects users of the standard AM and FM radio broadcast bands from interference. The allocated 1.7 to 80 MHz BPL spectrum does tread on present viewers of low VHF channel terrestrial television, along with other users as described in other paragraphs. The apparent abandonment of protection for shortwave listeners (“SWLs”) by the NPRM begs the question of why citizens who are active SWLs should have any less equal access to their broadcast sources as do those of the “standard” commercial broadcast sources. The Commission is totally failing to protect spectrum for these users, and the current NPRM does not appear to offer mediation relief. Radio receivers tend to be other Part 15 devices, thus they must accept interference. BPL introduces a source which has not existed within the spectrum range of HF SWL receivers, with the effect that SW broadcast listeners will not be able to access information to which they are entitled. It is essential that the Commission mandate clear frequency areas within Access BPL that corresponds to the major international shortwave broadcast bands, just as it is already committed to minimizing interference to licensed and Federal users.
22. The claims of BPL proponents about antenna characteristics are just not fully supported by actual testing done by NTIA⁴ and ARRL (as cited by NTIA). These claims must not be accepted until and unless a full engineering review of their basis is performed by FCC OET, or other appropriate engineering entity.

⁴ “Potential Interference from Broadband over Power Line (BPL) Systems to Federal Government Radiocommunications at 1.7 to 80 MHz - Phase 1 Study”, NTIA report 04-413, sent to FCC on April 27, 2004.

⁵ *Ibid*, page vi.

31. In view of carefully considered and extensive tests submitted by the many NOI commentors, I find it incredulous that the Commission can make statements such as “we believe these interference concerns can be adequately addressed”. Unless the Commission has decided to abandon its function of spectrum protector, it should be pressing the proponents of Access BPL to show full **technical** reasons and ways that they think they can mitigate interference issues. A detailed study of BPL provider mitigation proposals needs to be done by a combination of FCC engineers and staff engineers at agencies such as NTIA and FEMA before full blanket approval for deployment proceeds. Further, the Commission should be pressing the BPL proponents to show how they will be able to provide adequate subscriber service in view of the protected frequency list submitted as Table 4-9 in the NTIA report and all of the present licensed HF users, including the Amateur Service.
- 33, 34. The issue that is consistently overlooked is that fact that existing Part 15 emission levels are already too high to be compatible with Amateur Radio HF spectrum usage in many situations. Interference to Amateur Radio stations by trial Access BPL systems is **fact**. This author performed on-site spectrum analysis measurements at the home of Mr. James Spencer, WØSR, in Cedar Rapids, IA, in early April, 2004. Mr. Spencer’s home and associated antennas for HF operations are located approximately 500 to 600 feet from a BPL device in the Cedar Rapids trial area⁶. For any communications medium or mode, the key to not experiencing harmful interference is maintaining a reasonable signal to noise (S/N) ratio at the receiving device. Modern HF communications receivers can typically provide usable information with signals having less than 1 microvolt strength (-107 dBm in a 50 ohm system), assuming that HF atmospheric noise (including thunderstorm “crashes” and solar phenomena) are low enough to yield a S/N of at least 10 dB. The spectral plots, taken on all HF Amateur bands, plus the 160m Amateur MF band, show that the interfering signals are on the order of slightly more than 10 dB to more than 30 dB above 1 microvolt in a 3 kHz bandwidth. These results tend to support the claim in FEMA’s original filing of needing a 30 dB signal power increase in BPL areas, and are consistent with some of the conclusions in the newly released NTIA document⁷.
36. I again remind the Commission that compliance to Part 15 limits is only part of the equation. The underlying determination of harmful versus not harmful interference is

⁶ The spectrum plots were made using Mr. Spencer’s existing HF antennas. These consisted of an “L” configured wire antenna for the 160m band, a dual band inverted-V for the 80 and 40 meter bands, a tri-band rotatable yagi for the 20, 15, and 10 meter bands, a rotatable dipole for the 30, 17, and 12 meter bands, and a ground-mounted trap vertical, with radials, for the 40m through 10m bands. The spectrum analyzer was set to use a measurement bandwidth of 3 kHz, which is typical for SSB receivers as used on the HF bands. That is not the typical bandwidth used to make FCC measurements of Part 15 devices, but does closely represent the spectrum as detected by an equivalent receiver with SSB voice capability.

⁷“Potential Interference from Broadband over Power Line (BPL) Systems to Federal Government Radiocommunications at 1.7 to 80 MHz - Phase 1 Study”, NTIA report 04-413, sent to FCC on April 27, 2004, Executive Summary, pg. vi.

the net S/N as experienced by the HF receiver, NOT whether or not a given Access BPL system complies with Part 15.

37. Portions of paragraph 37 are seriously and significantly flawed. With respect to aeronautical services, I remind the Commission of the filing by ARINC in response to the NOI (Docket 03-104) in which they conducted a test with a single Part 15 device (from Phonex) and found that it caused interference in the 3 MHz region at a distance of 5 miles from the ARINC HF receivers. Although the Phonex was not an Access BPL device, this scenario is exactly of the type that has been claimed by BPL opponents and which is occurring right now in the trial areas. While it is true that house wiring will have a different radiation pattern than outdoor power lines, it must be noted that the Phonex device uses less power than BPL systems. My concern is that antenna characteristics and equipment performance for the Amateur Service bands of 160m and 80m are very like those at the approximately 3 MHz ARINC frequency. Again, the real issue is that allowed Part 15 radiated emission levels are **not compatible** with HF communications. Period.

A questionable part of this paragraph states "... that most public safety systems are designed so that mobile and portable units receive a signal level significantly above the noise floor. From an interference analysis standpoint, this latter characteristic distinguishes public safety systems from amateur radio stations using high-sensitivity receivers to receive signals from transmitters often thousands of miles away." This is warped logic written by someone who does not understand present day deployed radio systems. Although the paragraph goes on to describe the public safety channels as those between 25 and 50 MHz, consider that the 10m Amateur band covers 28.0 to 29.7 MHz, and the 6m band is adjacent to the Public Safety band, covering 50 to 54 MHz. Thus, propagation characteristics apply equally to Public Safety and Amateur Service users in these ranges. While it is true that most Public Safety users are not interested in the net results of inadvertent HF and low band VHF skip propagation conditions, the radios they use are very similar to those used by the Amateur Service, especially for F3 modes. (The Commission might not be aware that many older Public Safety radios end up in Amateur Service, usually because they have superior characteristics over the standard communications radios. However, the Public Safety radios – old or new - are no more able to provide adequate S/N when there is on-channel interference than any other type of radio.) The main issue here is what difference does it make to anyone if an Amateur Service operator is working 1500 miles on either 10m or 6m versus the Public Safety operator only needing to communicate 25 miles? Both are licensed. **Both have radio receivers with similar technical characteristics (for a given mode), including sensitivity and bandwidth.** Both are entitled to communications free from harmful interference (reasonable S/N, as described earlier).

The concept of coordinating Access BPL systems with public safety agencies is directly in line with the latest NTIA filing⁸. For the many reasons cited by both

⁸ *Ibid*, pp. 4-8 to 4-13.

FEMA and NTIA, coordination with the Public Safety users within the Access BPL spectrum should be mandatory prior to deployment of a BPL system.

38. There is no reason that conducted emission measurements could not be made on unpowered lines in order to establish a correlation basis between the radiated emissions and the actual conducted emissions of a given system. (Alternative means would be needed to power the BPL equipment, but the dangerous distribution voltages would be removed while measurements with LISNs are performed.) Since conducted emission current is a function more of the EUT than of the external wiring, setting a maximum conducted current limit that could be measured by the manufacturer on a test bed at least establishes a level playing field for all providers, and might help to minimize deployment of systems running excessive output power.
39. I thank the Commission for stating that operations must cease if harmful interference is caused to licensed services. In view of that requirement, I believe the Commission should require Access BPL providers to certify that they can still provide subscriber service, even if large portions of the spectrum must not be used or parts of the system shut down, especially if a given area contains a large number of HF spectrum users.
40. The term “harmful interference” continues to be used freely throughout the NPRM without defining it. Again, a S/N of 10 dB is typically required for voice communications. It is very likely that Access BPL systems will not be able to reduce level sufficiently to meet that criteria at a given licensed user’s location. The BPL providers must realize that compliance with Part 15 levels in no way assures meeting harmful interference criteria. The Commission should invite spectrum users to submit their technical requirements for acceptable S/N ratios and use that information as a baseline criteria for defining what constitutes harmful interference. Spectrum users with different communication modes will have different thresholds of pain. Leaving the term “harmful interference” undefined only invites a long string of contentious filings and arguments between BPL providers and spectrum users. The OET, along with engineers from other Federal agencies, the ARRL, and spectrum users could develop a standard reference point.
42. Besides mandatory shut-down capability (certainly needed if communication emergencies arise) and requiring operation across a minimum range of frequencies, the rules should also mandate, or at least suggest, that systems should be designed to use balanced transmission line, rather than single-ended, in order to take advantage of reduced emissions possible with a balanced transmission medium. I applaud the Commission for encouraging BPL providers to work with Amateur Radio Service operators in developing mitigation techniques. However, the mandate is clear: no harmful interference in any of the Amateur bands, 1.8 MHz through 54 MHz. In cases where the power lines run down a back alley and pass within a few meters of the antennas used by an Amateur operator, the emissions will need to be essentially zero in those bands. Meeting Part 15 limits will be totally unacceptable. This has to be made clear to those who would make the BPL equipment and to those who would use it and sell services.

44. I refer the Commission to the NOI filing by ARINC⁹, regarding interference to HF operations by Phonex (and similar) devices. That is a documented case of in-building systems causing interference. A resolution in that instance was not possible because of the widespread use of Part 15 devices within a confined housing area. The Commission should be aware that the deployment of BPL, both Access and In-Home, can only lead to more such instances.
45. Measurements for Access BPL systems will require some new thinking. My comments for paragraph 38 state that I believe conducted measurements and requirements should remain intact. This is especially true if the IEC is working on conducted emission limits¹⁰. However, I think a correlation method should be implemented so that field conducted measurements on live HV wires are not required.
48. As previously stated, Homeland Security is not advanced by BPL. Neither is emergency preparedness. Communications success for these important items of regional and national priority can only be assured when those doing the communicating can hear the other party. Assured clear frequencies per NTIA Table 4-9¹¹, as well as all Amateur Radio Service frequencies, military MARS, and those of Public Safety agencies in the lower VHF range, are absolutely essential for not undermining the base of Homeland Security and emergency preparedness providers.

Appendix C:

Part 1, item 6): A magnetic loop antenna may well lack sufficient sensitivity if used at the 10m range. An active or passive E-field rod antenna, or broadband dipole with calibrated antenna factor, should also be permitted.

Part 2, item b.1): The 10m horizontal separation should be in the plane of the overhead line, not below it. *(This will produce a reading as less affected by ground effects and more akin to the "view" of the overhead lines as seen by any nearby located communications antennas.)*

Part 2, item c: Measurements should also be made for at least one full wavelength at the lowest frequency of operation, measured outward from the in-ground transformer. *(Unless the feeder lines are run in buried metal conduits, it is possible that emissions from the buried cables could reach a peak higher down the line than that measured at the transformer.)*

Final comments:

⁹ Aeronautical Radio, Inc. "ARINC", Filing on Docket 03-104, pg. 4.

¹⁰ As cited on page 20 of the NPRM.

¹¹"Potential Interference from Broadband over Power Line (BPL) Systems to Federal Government Radiocommunications at 1.7 to 80 MHz - Phase 1 Study", NTIA report 04-413, sent to FCC on April 27, 2004, pp. 4-9 to 4-12.

I still maintain that Access BPL is a technologically bad idea that should never have seen the light of day. It is flawed because it trespasses upon an irreplaceable natural resource, the HF spectrum. The fact is that other methods can be used by power companies if they wish to compete for broadband customers in any areas. There are no technical reasons to support BPL (the use of the power wires is an economic issue), only many technical reasons why it is a bad idea. The apparent widespread use of single wire lines for sending the data between BPL units is especially disappointing, as that is a worst-case situation for radiated emissions. In my opinion, the BPL equipment vendors are not trying hard enough to meet the concept of no harmful interference to licensed (or incumbent) users.

The electromagnetic spectrum and the laws of physics do not bend to accommodate economic desires. Since BPL systems are intruders into the spectrum, full responsibility for maintaining **usefulness to all incumbent users, including those who are only listeners**, of the affected spectrum must fall on these systems and the FCC. Standards are needed for both the measurement of the fields from these systems, but also in determining what constitutes “harmful” interference. As one who has lead the development of standards and participated in the process, I can assure the Commission that an *acceptable* standard will require broad input, consensus by all stakeholder parties, and acceptance by industry and the international standards bodies.

I thank the Commission for the opportunity to submit these comments.

Sincerely,

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NARTE Certification #EMC-001549-NE